Workshop Lasercutting

1. Introduction

With a laser cutter, you can cut through, line etch and raster etch.

- Cut through: guess what this means. **Needs a vector line.**
- Line etch: with a cutting line, but not cut through, somewhere in the half of the material thickness. **Needs a vector line.**
- Raster etch: etching a surface somewhat like an inkjet printer does: line by line horizontally. Needs whatever: a text, a jpeg, etc. From whatever environment (word, photoshop, etc.)

Check out some samples to get an idea.

Going over the machine **VLS 4.60**:

- Laser tube 60W
- Optical mirrors & lense
- Pressured air
- Suction with honeycomb grid

Max workable area: **600x450mm**.
Max height for objects: about 200mm but depending on the use.

What (thickness) can be lasercut/etched: depends on the material, what you want to do, what quality you're after,…

2. Preparing the files

Most vector graphics packages can be used as input for lasercutting.

The PC at the machine doesn't run any package, put all settings right and export/print to a **vector pdf file**. You can lasercut directly from a good pdf file.

Instructions below are what we mostly use and have experience with. Probably a lot more software programs can be used.

Illustrator

When drawing in Illustrator, use following settings:

- Set the **Document Color Mode** to **RGB Color**
- Set all line thicknesses to **0,025mm**
- Set all cutting lines (stroke) to **RGB red** (R 255 G 0 B 0)
- Set all etching lines (stroke) to **RGB blue** (R 0 G 0 B 255)
- Set all etching surfaces (fill) to **RGB black** (R 0 G 0 B 0)
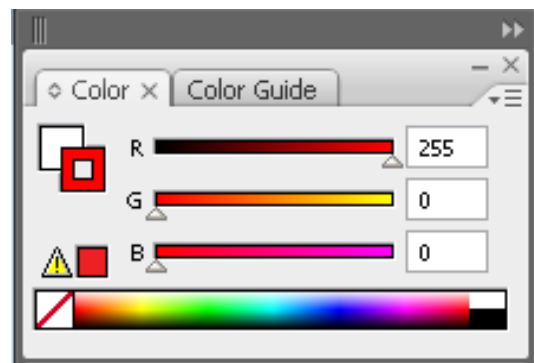
Any other images (jpg or alike), line thicknesses or colors will be treated as etching surfaces as they will be turned to grayscale. For the most intense result, use RGB black.

When using images within an illustrator file, only use **jpeg**. Others give problems while printing.
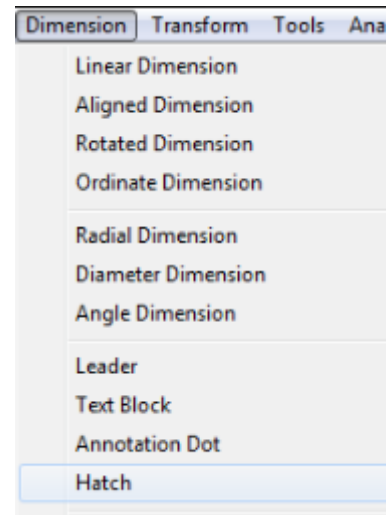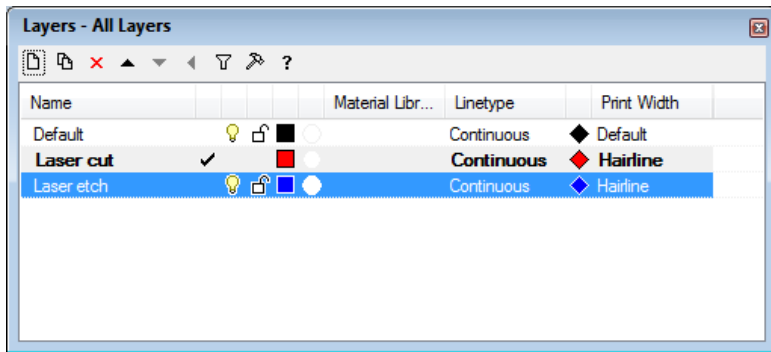
AutoCad

Use separate layers for different things and just save as a .dwg or .dxf file. This can be imported in Illustrator or Rhinoceros for easier setting up the colors, etc. Or you can set a print layout for lasercutting.

Expect some **trouble**, after all, it is AutoCad.

Rhinoceros

Use separate layers: red for laser cutting, blue for line etching.
Print Width: Hairline.

For raster etching, use Dimension -> **Hatch**
And hatch the closed line in black.
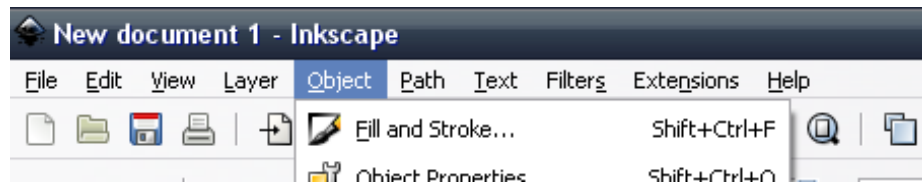
You can't add jpeg images in Rhino.

CorelDraw
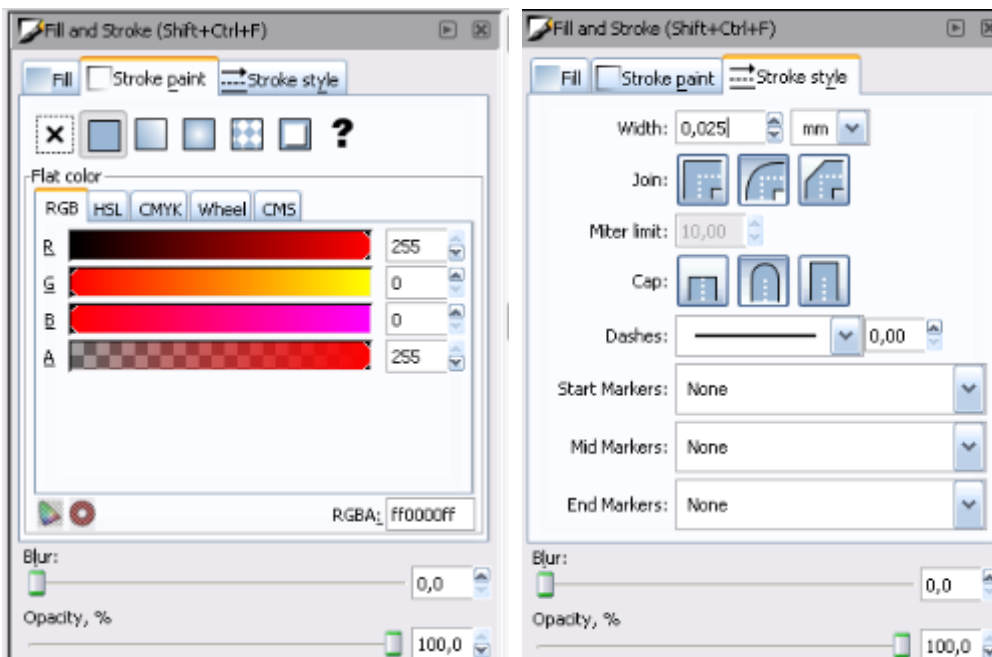Use the settings like in Illustrator.

Inkscape

If nothing else is available: use this open source vector graphics package. **www.inkscape.org**

Import a file or draw from scratch. Importing: pdf and keep all default values.
After doing your thing, select all cutting lines, Object -> Fill and Stroke

Again, check color and line thickness

3. Lasercutting, finally.

Sending stuff to the lasercutter

You can send something to the lasercutter by using "Print". The lasercutter behaves as an ordinary printer hooked up to the PC.

Once you "printed" your file, open the the driver for the lasercutter. Click the red icon to do this.
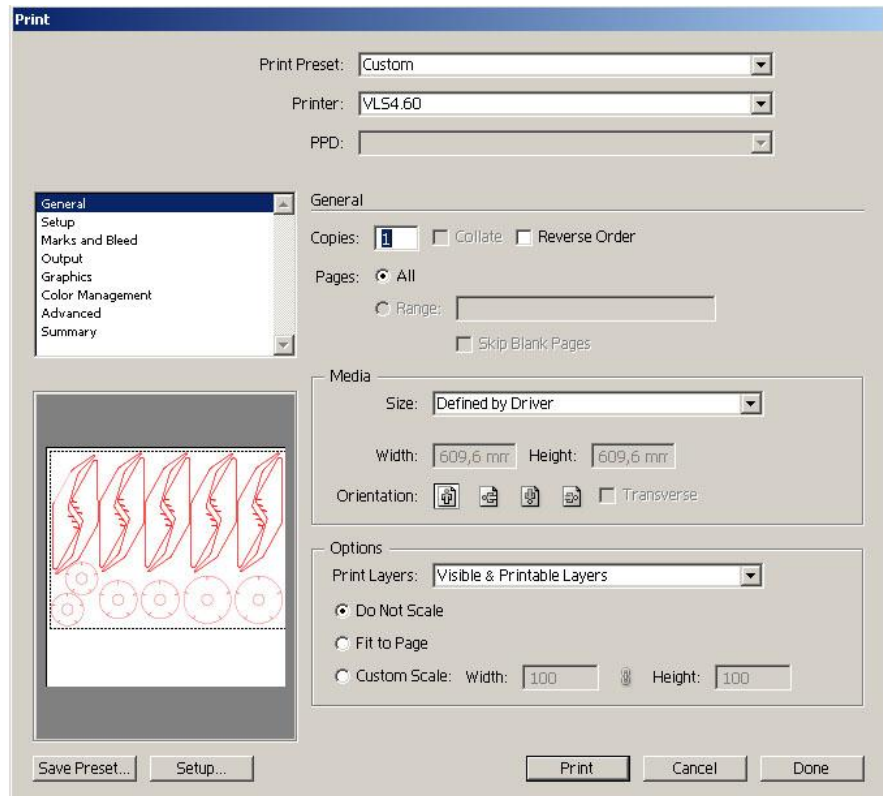
If your set colors (red/blue) don't match your drawing in the driver software, you've done something wrong: check the color settings, line thicknesses,…

Aligning
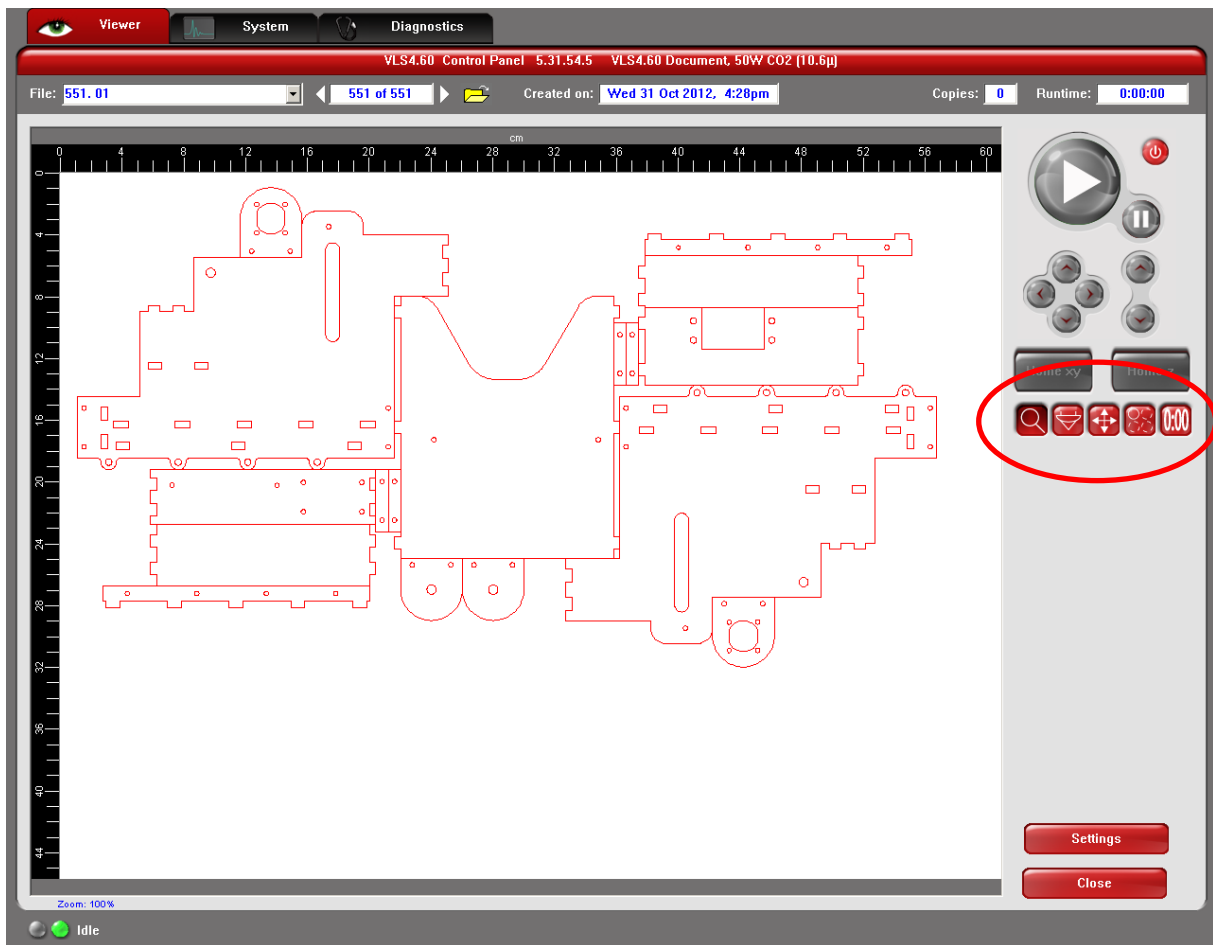
For aligning & preparing the job, use these 5 icons:

- **Zoom** (no need for this, you can zoom in the **Relocate View** too)
- **Focus View** (for physically setting the laser head to a chosen point by clicking)
- **Relocate View** (for moving the preview where you want it, more or less)
- **Duplicate View** (for making multiple arrays of your job, handy sometimes)
- **Estimate View** (for estimating how long the job would take, takes as long as the job itself)

Relocate View; use this for:

- Panning the view to where you want it (nice & quick, use the rulers as a help)
- Setting one of the 9 reference points on your view, to the **Focus View** (if you set one)
- Zooming in (left mouse button) & zooming out (right mouse button)

Setting materials, thickness, laser power…

Choose **Settings**
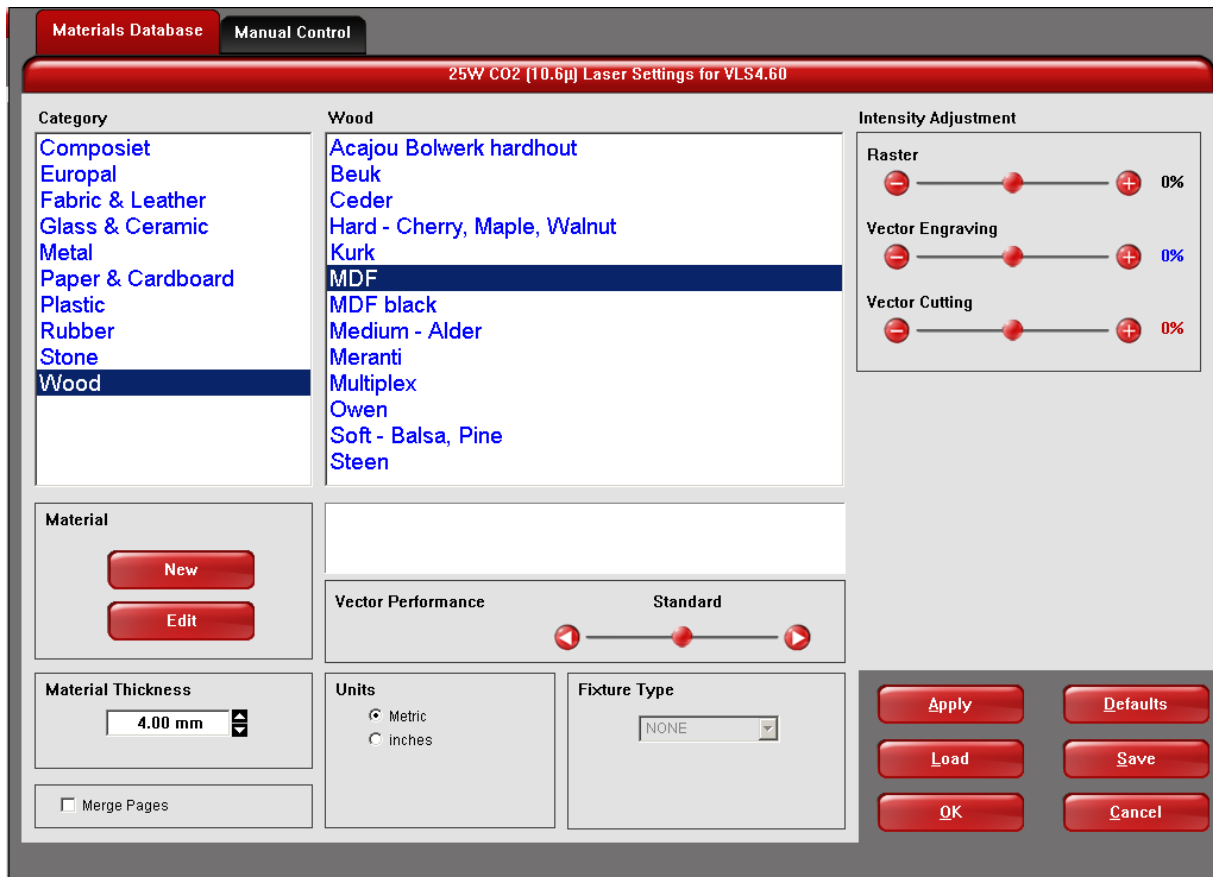
Materials Database allows you to use one of the materials that are already in there.

Set the **Material Thickness** quite precise (0,1mm).

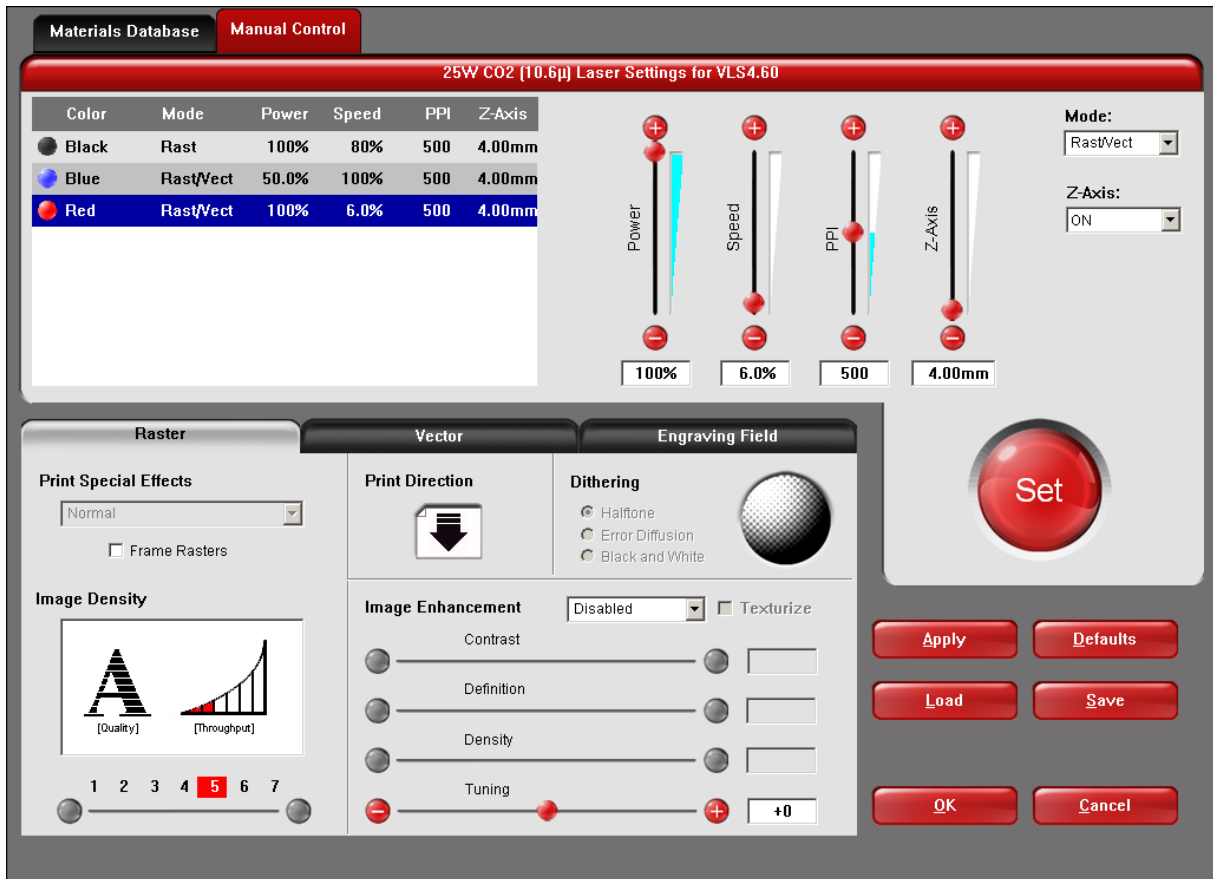You can adjust the laser effectiveness by the sliders under **Intensity Adjustment**. This is ok for once, but don't use this if you intend to laser the same material later again, nothing of the settings is stored and you don't even know exactly what happened.

With **Manual Control** you can adjust the 2 main parameters when laser cutting: **Power** & **Speed**. Manually, no settings will be saved. You cán save these settings, but it's better to create a new material in the **Materials Database**.

Easiest way to make a new material:

- Choose a material in the **Materials Database** that looks closest to what you have (for example some sort of tropical wood, choose *Hard wood* to start with).
- **Edit**
- **Clone** and choose a new name.
- Adjust the parameters, probably mostly **Vector Cutting.** Only way the find the good settings, is experimenting. Quickest way to do this: **Manual Control** and copy the suited settings.

MDF

Material Code:	9034 (9000 - 9999)	Laser Power:	50W
Material Name:	MDF		
Category:	Wood	Edit	
Image Enhancement	Disabled	Rubber Stamp Support ☐	
	Material Enabled ☑	Fiber Support ☐	
	CO2 Support ☑	3D Support ☐	

Configuration Laser Mode ● CO2 Parameters ○ Fiber Parameters

Raster Engraving

Power:	100%	Contrast:	0.0
Speed:	80.00%	Definition:	0.0
Tuning:	0	Density:	80.0

3D Power

Notes:

Image Density: 5

Vector Engraving - Blue Pen

Power:	50.00%	PPI:	500
Speed:	100%		

Vector Cutting - Red Pen

Material Can Be Vector Cut ☑

Max Depth:	6.0 mm	PPI:	500

Fiber Laser Settings

Simmer Power:	0.00%		
Raster Frequency:	0	Raster Waveform:	0
Vector Mark Frequency:	0	Vector Mark Waveform:	0
Vector Cut Frquency:	0	Vector Cut Waveform:	0

Shallow Cut Settings

Cut Depth:	4.0 mm
Power:	100%
Speed:	6.00%

Deep Cut Settings

Cut Depth:	6.0 mm
Power:	100%
Speed:	4.00%

Clone Delete Hide Material Apply Close

Actually lasercutting…

Turn on the laser cutter (power button) in the driver software or on the machine itself.

Lower the table if the material can interfere with the laser head (Z buttons in the driver software or on the machine itself).

Turn on the suction power. Forgetting this will result in smoke, smell, gasses,… Eventually a hurtfull death, just turn it on.

Turn on the air compressor. Forgetting this could result in a poor laser cutting quality, flames and fire AND breaking the main laser lens. This will also result in a hurtfull death, just turn it on.

Hit the **Play** button (turns green after hitting the power button of the laser cutter).

Hitting **Pause** stops the machine. Hit it again to start where it left off. Hitting **Play** will start the job over.

Opening the cover during a job immediately shuts down the laser, this is a safety measure. The laser head will keep on moving though.

Laser etching on an object or really thick stuff

You can set the **Material Thickness** to very high levels, but you will get an error (which you can click away with no problem).
But for larger objects you need to **remove the honeycomb grid** (lower the Z table a bit, open the front door and remove it).

Under the **System** tab, **Auto Z** should **NOT** be Enabled.
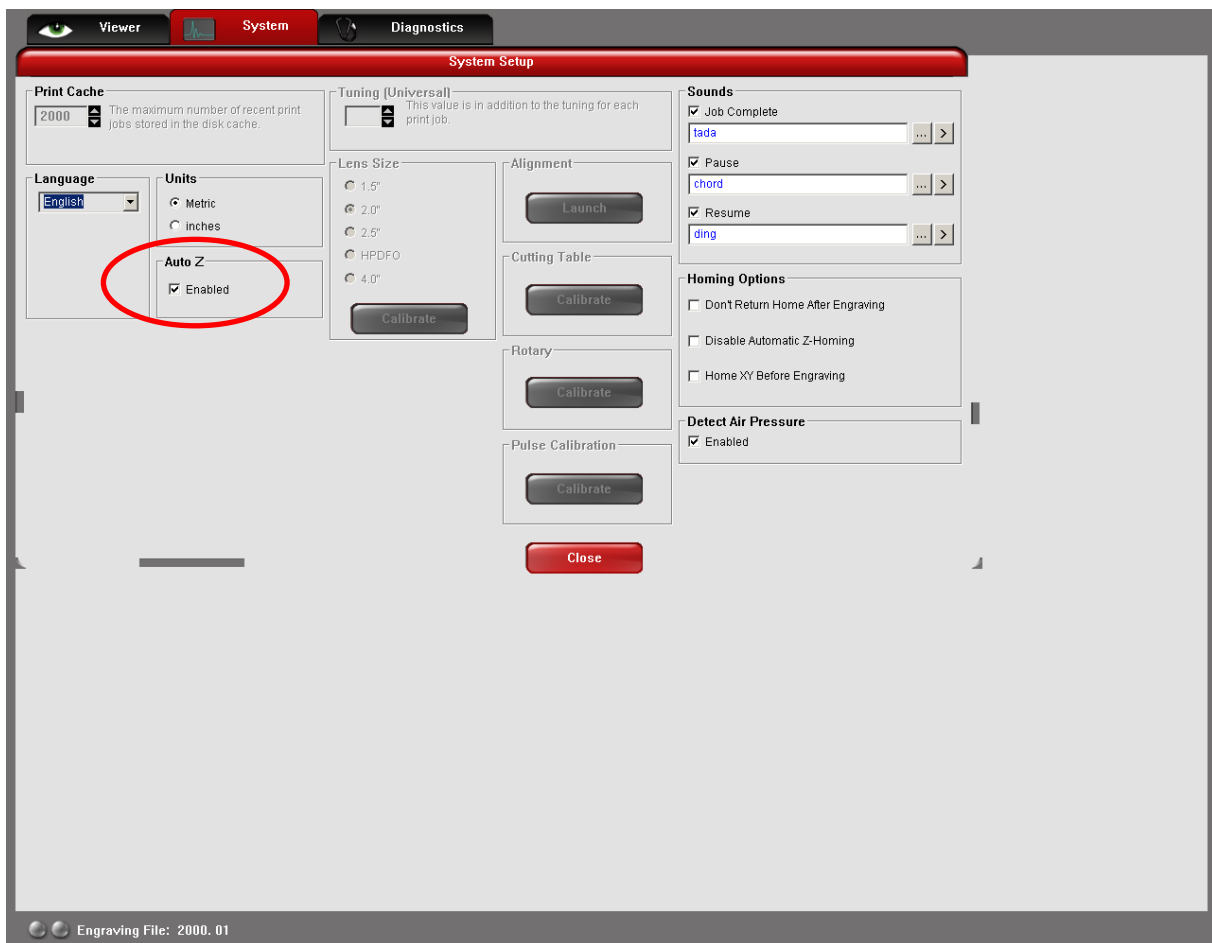
Auto Z always uses the predefined Z-height of the honeycomb grid as 0-position for Z. By entering a **Material Thickness**, this is the reference. Disabling this means you have to set it manually. This is done with the help of the black/white tool (see demonstration, ridiculous to explain this…).

!!! After doing a job like this **ALWAYS Enable Auto Z** again, because otherwise laser cutting won't go well as the Z height won't be good.

!!!! Before doing a job like this, **MAKE SURE Auto Z is Disabled**. If not, the laser head could hit the material pretty bad, resulting in probable damage to the laser head, belts, bearings,… And eventually a hurtfull death for you. Again.

Practical thoughts in general

- Maximum sheet size to put in the laser cutter: 600x450mm in landscape orientation. Set your document settings to this.
  Smaller sheets can also be used of course.
- Raster etching takes a lot more time than laser cutting. So try to minimize this as there are others waiting…
- Raster etching doesn't give a good result in all materials. Experiment and look at the examples.
- Pictures can be etched. Try to make a really high contrast (in photoshop for example) and sometimes you get the best result by making a negative: remember: what is black, will be etched.
- Curved surfaces (like a bottle) can also be etched although the distance between the highest point and lowest point shouldn't be more than about 5mm.
- Tolerance of laser cutting depends on material and thickness. So when making 3D objects, it's possible that you need to draw a gap of 5,8mm to snug fit a sheet in of 6mm. Experiment!
- A sheet can have a tolerance of a few 10th's of a mm, so previous point can be difficult sometimes.
- You always need an oversized sheet, it's not so easy to fit a drawing very precise onto a piece of sheet or object.
- Designing 2D stuff is cool, designing 2D stuff to make 3D stuff is cooler.

Materials to use.

In general: some materials leave a layer of ashes on the cutting side, this can usually be wiped off easily. You might get dirty hands though…

- PMMA (very well suited) but most other plastics can be used, up to about 8-10mm. **Except PVC.** Up to 8mm <u>can</u> be done, although in some cases, special alignments or preparations are needed. So try to stick to designs with thinner sheet materials.
- Cardboard, paper.
- Wood, MDF. Depending on the hardness/thickness, to be used for etching or cutting.
- Glass can be etched.
- Painted metal can be etched (the paint is removed by the laser).
- Textiles are nice to experiment with.
- Leather for cutting and etching.